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A COUNTING-CAGE HEATER FOR WINTER STUDIES OF INSECT POPULATIONS IN THE FIELD

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A heater for use in connection with the square-foot counting cage1/ has been devised and successfully used in winter field studies of the beet leafhopper at the Grand Junction, Colo., laboratory. By means of this heater the temperature inside of the counting cage can be maintained well above 110° F. when outside temperatures are as low as 20° to 25°. Opportunity has not been afforded to test the equipment with outside air temperatures lower than this, but it is believed that good results could be obtained.

Successful population sampling has been accomplished with this heater when air temperatures were approximately 25° F. accompanied by ½ to 1 inch of snow on the ground. Under these conditions a total heating time of about 30 minutes was found necessary to be sure all leafhoppers were activated. Approximately 15 minutes was required to melt the snow and another 10 minutes to dry the plant and ground and activate the leafhoppers. The remaining 5 minutes was usually found sufficient for the removal and counting of the insects. Where no snow cover was present, 15 minutes was usually found to be adequate time for the reactivation of the leafhoppers. Among other insects noted to be activated in the cage by short periods of heating were Geocoris bullatus, Nysius ericae, at least two species of Pentatomidae, and several species of Coleoptera, besides spiders and mites. The spiders and mites usually became active before the insects.

The heating device consists of a 12-inch piece of automobile exhaust pipe 1-7/8 inches in diameter. The outside diameter of an exhaust pipe of this size happens to be just right to fit inside standard 2-inch flexible metal tubing, and about 2 feet of this tubing is attached to each end of the pipe (fig. 1, A and B).

1/ Hills, O. A. A New Method for Collecting Samples of Insect Populations. Jour. Econ. Ent. 26: 906-910, illus. 1933.

A funnel-shaped asbestos collar (fig. 1, C) is placed around the exhaust pipe in such a way that the small end of the funnel fits tightly around the pipe while the large end of the funnel stands away from the pipe about 1 inch. By placing a blow torch in such a manner that the flame will strike between the asbestos collar and the joint of exhaust pipe (fig. 1, D), the pipe can be made very hot. To force the heated air inside this pipe through the tube A and into the sampling cage, a small electric blower fan is connected to the end of tube B (figs. 1 and 2, E). This is the same type of blower fan as has been described for use as a suction collector in connection with the square-foot counting cage.1/ It has been found more practical, however, to supply the power by means of a 6-volt automobile storage battery than by dry cells as described in connection with the counting cage. Tests have shown that a storage battery will run the fan motor 24 hours continuously without slowing down. Just how much longer it would run is problematical. A small charger costing about $8 has been successfully used to keep the battery charged.

It was sometimes found advantageous to run the blower fan at lower speeds, particularly when removing insects from the cage. At top speed the draft from the fan tends to blow light trash about the cage, making it more difficult to detect the insects. In order to slow the fan down, a small rheostat switch, similar to those used on hot-water automobile heaters, was installed (fig. 2, F). This switch also serves for starting and stopping the fan motor.

To facilitate connection of the small wires to the storage battery terminals, positive terminal posts from old dry-cell batteries were mounted on the storage-battery terminals (fig. 2, G). This was done by drilling a hole in the storage-battery terminal, slightly smaller than the dry-cell terminal post, and then driving the post into the hole. The storage-battery terminal, being of lead, is malleable enough to allow for this. Battery clips could be used to accomplish the same purpose, but they would be slightly more cumbersome.

A simple and efficient handle for carrying the battery was made by bending a 2-inch piece of strap iron to fit across under the bottom and up the sides of the battery (figs. 1 and 2, H). The ends of the strap iron were allowed to extend 3 inches above the top of the battery and were drilled to receive a 3/8-inch bolt. A bolt 3/8 by 10 inches was then placed through the handle for carrying the battery, and the blower fan and switch were mounted on the bolt outside one of the strap-iron ends, as shown in figure 2. A second nut was placed on the bolt on the battery side of the strap iron so that the outside nut could be tightened against this sufficiently to hold the motor and switch in place without bending the ends of the strap iron in over the sides of the battery.

The whole tube assembly (fig. 1, A, B, C) is supported at two points. One end of tube B is attached to the blower fan, and a heavy wire leg is placed at the junction of tube A with the exhaust pipe section (fig. 1, I). By grasping the battery carrier handle in the right hand and allowing tube B to flex sufficiently to grasp tube A in the left hand, the whole assembly is easily carried.

The only alteration necessary to the square-foot sampling cage is the addition of a second sleeve to allow for the insertion of tube A (fig. 1, J). The cage handle is superfluous in winter, since the insects are entirely inactive when the cage is placed over the plants.

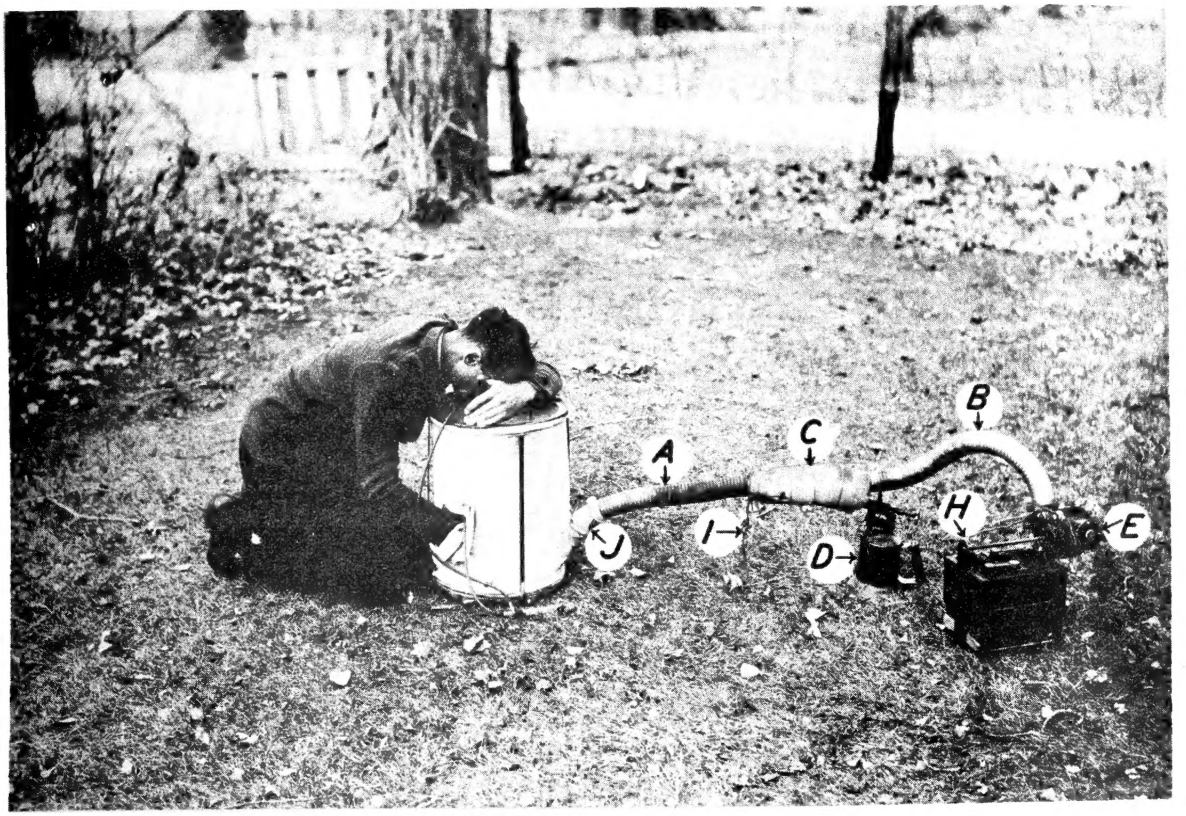

Figure 1.--Sampling cage and heater in use: A and B, 2-inch flexible metal tubing; C, asbestos collar around automobile exhaust pipe; D, blow torch; E, blower fan; H, combination carrying handle and support for blower fan; I, heavy wire leg to support tubes; J, small sleeve to allow for insertion of heater tube.

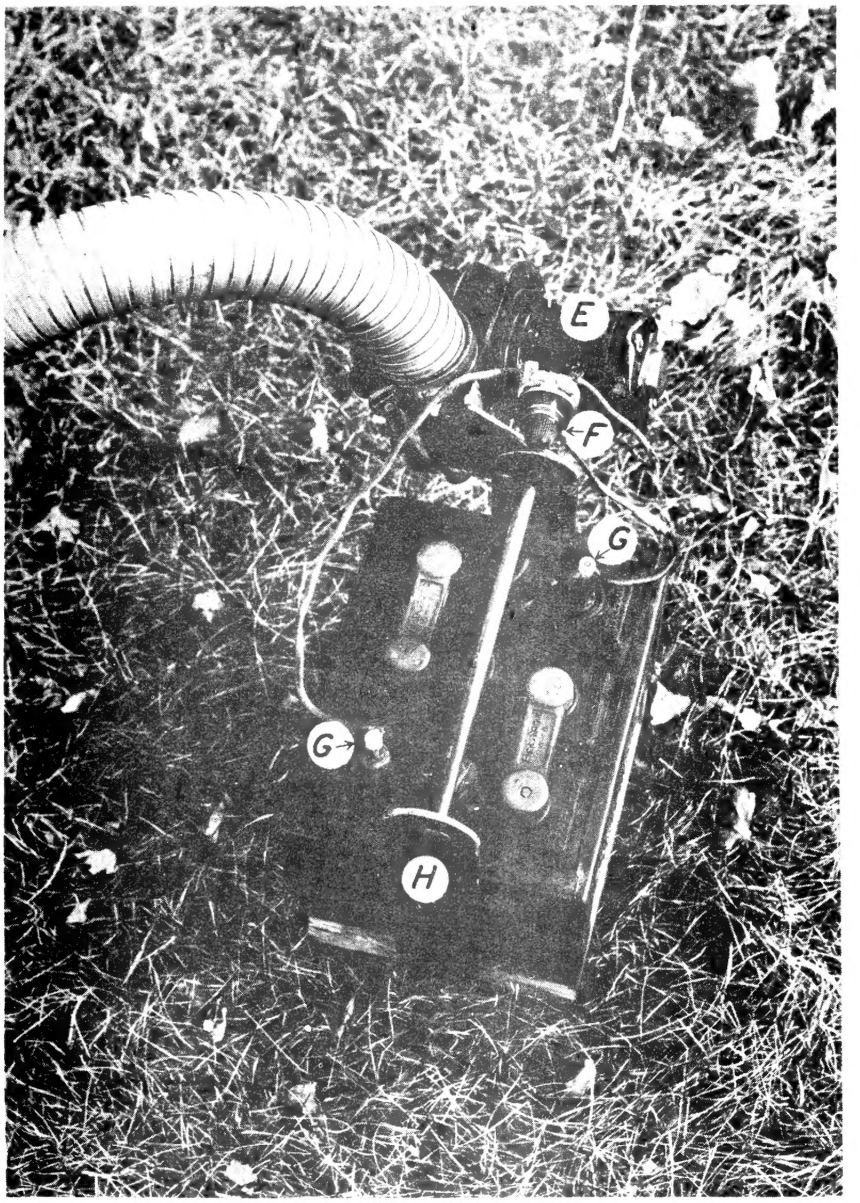

Figure 2.--Close up of storage battery and fan assembly: E, blower fan; F, rheostat switch; G, dry-cell battery terminals; H, combination carrying handle and support for blower fan.